

IEEE Standard Letter Designations for Radar-Frequency Bands

Sponsor
**Radar Systems Panel of the
IEEE Aerospace and Electronic Systems Society**

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IEEE Standards Board

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Foreword

(This Foreword is not a part of IEEE Std 521–1984, IEEE Standard Letter Designations for Radar-Frequency Bands.)

The IEEE Standard Letter Designations for Radar-Frequency Bands was first issued in 1976 and was written to remove the confusion which developed from the misapplication to radar of letter-band designations of other microwave frequency users. This standard relates the letter terms in common usage to the frequency ranges which they represent. This revision defines the application V and W to a portion of the millimeter wave region while retaining the previous letter designators for frequencies below the millimeter region. Suggestions for the improvement of this standard will be welcomed. Comments should be sent to the

Secretary
IEEE Standards Board
Institute of Electrical and Electronics Engineers, Inc
345 East 47th Street
New York, NY 10017.

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IEEE Standard Letter Designations for Radar-Frequency Bands

1. Scope

Since World War II, radar systems engineers have used letter designations as a short notation for describing the frequency band of operation. This usage has continued throughout the years and is now an accepted practice of radar engineers. Radar-frequency letter designations are used for the following reasons:

- 1) They provide a convenient method for describing the band in which the radar operates without the need for awkwardly stating the limits of the frequency in numerical terms. For example, it is more convenient to say an L-band radar than a 1215 MHz to 1400 MHz radar. This is especially important in titles of published papers on radar, in advertising of radar systems and components, or in any other situation where a short notation is desired.
- 2) In military radar systems, the exact frequency of operation cannot usually be disclosed, but it is permissible in many cases to describe the band in which it operates. The letter designations permit this.
- 3) Each radar-frequency band has its own particular characteristics. Thus an X-band radar will be different from an S-band radar. The letter designations are often used in this manner to indicate the particular nature of the radar as it is influenced by its frequency. There are vast differences in characteristics, applications, and environmental constraints which distinguish radars in the different bands. It is the need to communicate concisely the whole set of characteristics which are shared by S-band radar, as distinguished from L-band radar, C-band radar, and the others, which requires the established usage of letter designations.

2. Usage

The nomenclature of Table I shall be followed when letter designations are used to describe the frequency of radar operation. When appropriate, it is suggested that the specific International Telecommunications Union (ITU) Radiolocation numerical band limits be inserted parenthetically; for example: VHF (216 MHz-225 MHz) or L-band (1.215 GHz-1.4 GHz).

3. Relation to Other Nomenclature

The radar letter designations are consistent with the recommended nomenclature of the International Telecommunications Union (ITU), as shown in Table 2. Note that the high frequency (HF) and the very high frequency

(VHF) definitions are identical in the two systems. The essence of the radar nomenclature is to subdivide the existing ITU bands, in accordance with radar practice, without conflict or ambiguity.

The letter band designations should not be construed as being a substitute for the specific frequency limits of the frequency bands. The specific frequency limits should be used when appropriate, but when a letter designation of a radar-frequency band is called for, those of Table 1 shall be used.

The letter designations described in this standard are designed for radar usage and are used in current practice. They are not meant to be used for other radio or telecommunication purposes, unless they pertain to radar.

The letter designations for Electronic Counter-measure operations as described in Air Force Regulation No 55-44, Army Regulation No 105 86, and Navy OPNAV Instruction 3430.9B are not consistent with radar practice and shall not be used to describe radar-frequency bands.

Table 1—Standard Radar-Frequency Letter Band Nomenclature

Band Designation	Nominal Frequency Range	Specific Frequency Ranges for Radar Based on ITU Assignments for Region 2, see Note (1)
HF	3 MHz–30 MHz	Note (2)
VHF	30 MHz–300 MHz	138 MHz–300 MHz 216 MHz–225 MHz
UHF	300 MHz–1000 MHz (Note 3)	420 MHz–450 MHz (Note 4) 890 MHz–942 MHz (Note 5)
L	1000 MHz–2000 MHz	1215 MHz–1400 MHz
S	2000 MHz–4000 MHz	2300 MHz–2500 MHz 2700 MHz–3700 MHz
C	4000 MHz–8000 MHz	5250 MHz–5925 MHz
X	8000 MHz–12,000 MHz	8500 MHz–10,680 MHz
K _u	12.0 GHz–18 GHz	13.4 GHz–14.0 GHz 15.7 GHz–17.7 GHz
K	18 GHz–27 GHz	24.05 GHz–24.25 GHz
K _a	27 GHz–40 GHz	33.4 GHz–36.0 GHz
V	40 GHz–75 GHz	59 GHz–64 GHz
W	75 GHz–110 GHz	76 GHz–81 GHz 92 GHz–100 GHz
mm (Note 6)	110 GHz–300 GHz	126 GHz–142 GHz 144 GHz–149 GHz 231 GHz–235 GHz 238 GHz–248 GHz (Note 7)

NOTES:

- 1 — These frequency assignments are based on the results of the World Administrative Radio Conference of 1979. The ITU defines no specific service for radar, and the assignments are derived from those radio services which use radar: radiolocation, radio-navigation, meteorological aids, earth exploration satellite, and space research.
- 2 — There are no official ITU radiolocation bands at HF. So-called HF radars might operate anywhere from just above the broadcast band (1.605 MHz) to 40 MHz or higher.
- 3 — The official ITU designation for the ultra high frequency band extends to 3000 MHz. In radar practice, however, the upper limit is usually taken as 1000 MHz, L and S bands being used to describe the higher UHF region.
- 4 — Sometimes called P band, but use is rare.
- 5 — Sometimes included in L band.
- 6 — The designation mm is derived from *millimeter* wave radar, and is also used to refer to V and W bands when general information relating to the region above 40 GHz is to be conveyed.
- 7 — The region from 300 GHz–3000 GHz is called the submillimeter band.

Table 2—Comparison of Radar-Frequency Letter Band Nomenclature with ITU Nomenclature

Radar Nomenclature		International Telecommunications Union Nomenclature			
Radar Letter Designation	Frequency Range	Frequency Range	Band No	Adjectival Band Designation	Corresponding Metric Designation
HF	3 MHz–30 MHz	3 MHz–30 MHz	7	High frequency (HF)	Dekametric waves
VHF	30 MHz–300 MHz	30 MHz–300 MHz	8	Very high frequency (VHF)	Metric waves
UHF	300 MHz–1000 MHz				
L	1 GHz–2 GHz	0.3 GHz–3 GHz	9	Ultra high frequency (UHF)	Decimetric waves
S	2 GHz–4 GHz				
C	4 GHz–8 GHz				
X	8 GHz–12 GHz	3 GHz–30 GHz	10	Super high frequency (SHF)	Centimetric waves
K _u	12 GHz–18 GHz				
K	18 GHz–27 GHz				
K _a	27 GHz–40 GHz				
V	40 GHz–75 GHz	30 GHz–300 GHz	11	Extremely high frequency (EHF)	Millimetric Waves
W	75 GHz–110 GHz				
mm	110 GHz–300 GHz				